REAR DÉRAILLEUR DEVICE FOR A BICYCLE

Background of the Invention

Field of the Invention

The present invention relates to an optimised rear dérailleur device for a bicycle, in particular, however, not exclusively appropriate for bicycles also comprising a front dérailleur and a gearshift system, the unit being controlled by a synchronized control handle.

Description of Related Art

An arrangement of two dérailleurs, front and rear, controlled by a single handle is known from the European Patent Application No. 95450012.0.

This arrangement is particularly interesting for the user with regards to riding, however, the particular advantage set forth in the present application, does not represent a direct interest to the user, rather it is the limitation of the chain length.

The fact namely that the number of combinations of the disks and pinions is reduced into a subunit determined by the entirety of combinations corresponding to the product of the number of pinions by the number of disks, is due to the fact that the alignment of the chain is optimised and the length of the chain is reduced.

SUMMARY OF THE INVENTION

Moreover, the market requires an improved ground clearance, in particular in the case of off-road bicycles, and it becomes clear that the rear dérailleur is particularly exposed to shocks and to getting caught, in particular when a great chain length has to be taken up.

The dérailleur according to the present invention moreover proposes a dérailleur, the ground clearance of which is considerably increased and the operation of which does not disturb the conception of the bicycle frame so that it can be mounted on the existing bicycle fleet without modification, on condition that a means for limiting the chain crossing is preferably present, so as to reduce the length of the chain, the fabrication of which necessitates pieces which can directly be industrially manufactured, the operation of which is the same for the user, the putting into service of which allows the conservation of the pinion and disk sets

existing on the bicycle, and the cost of which remains within the range of prices of the dérailleurs on the market.

For that purpose, the inventive dérailleur device is characterized in that it is equipped with a front dérailleur, a chain connecting a set of pinions and at least one disk and, if the case may be, a synchronized control limiting the combinations for an adapted chain alignment and for reducing the chain length necessary in the case of several disks, characterized in that it comprises:

- a rotatable base provided with a return spring forcing said base in anti-clockwise direction,
- guiding/dérailleur means fixedly connected to said base, and
- a movable tension plate fixedly connected to said guiding/dérailleur means.

According to a particular embodiment, the movable tension plate comprises a supporting arm, a tension arm mounted pivotable relative to said supporting arm, and a first and a second tension roller mounted freely rotatable on the ends of the tension arms, as well as a spring forcing the tension arm in anti-clockwise direction, whereby the chain passes over the first tension roller and under the second tension roller.

In particular, the tension arm is mounted onto an axis pivoting relative to the supporting arm, and said axis is essentially arranged in the centre of said tension arm or, according to a variant, said axis coincides with the rotation axis of the second roller.

According to a further characteristic, the guiding/dérailleur means comprises a deformable parallelogram carrying at its end, immediately downstream of the movable tension plate and in the alignment thereof, a guiding/dérailleur roller mounted freely rotatable, whereby the chain passes over this guiding/dérailleur roller.

An improvement provides that the guiding/dérailleur roller is supported by means for adjusting the translation in the plane of the chain.

Moreover, the guiding/dérailleur roller comprises additional means for lateral guidance such as at least one flange.

In a variant which is particularly advantageous for the fabrication as well as for the user's convenience due to an improvement of the dérailleur quality, connection means interposed between the movable tension plate and the guiding/dérailleur means are provided so as to restrain the tensional stress of the chain and the return stress of the guiding means.

> Brief Description OF THE DRAWINGS

According to a further improvement, the device comprises a crankcase for enveloping at least the rear dérailleur, the pinions, the disks and the chain.

The invention will be described in the following with respect to the enclosed drawings representing an arrangement according but not limited to a preferred embodiment, the different Figures showing:

> ~~Brief Description of THE DRAWINGS~~

- Figure 1 a side view of the rear dérailleur according to the invention mounted onto a bicycle comprising a set of pinions into which said dérailleur is inserted,
- Figure 2 a schematic functional view of the dérailleur in a first position depicting a set of disks with the front dérailleur thereof,
- Figure 3 a schematic functional view of the dérailleur identical to the one of Figure 2 but in a second position,
- Figure 4 a view of a realization variant in which the axis of rotation of the plate coincides with the axis of rotation of a roller,
- Figure 5 a side view of a realization variant with a return spring for parallel movement and common tension in the case of a pivoting arm with two rollers, and
- Figure 6 a view according to a further variant in the case of a movable arm with a single roller.

In Figure 1, the frame 10 of a bicycle is partially represented with the hub axle 12 equipped with a set 14 of pinions 16, in the present case seven pinions a to g, from the largest to the smallest.

The frame 10 comprises in a known and not limiting manner, two tubes 18 and 20 welded together, these two tubes forming a reception plate 22 of the rear dérailleur according to the invention.

A chain 24 connects the set 14 of rear pinions with the front disks, said chain being symbolized by a dashed line so as to maintain the Figure's necessary clarity.

A control cable of the rear dérailleur has the reference numeral 26 and its sheath 28. Said cable issues from a dérailleur control which is not represented since this control is not directly relevant for the present invention.

The dérailleur according to the invention comprises three essential parts, a base 30 supporting the dérailleur, a deformable guiding/dérailleur parallelogram 32, and a movable tension plate, so as to separate the guiding/dérailleur functions and the tension functions.

The base 30 comprises a body 36 mounted for rotating around an axis 38 and fixed to the reception plate 22 of the frame 10. This body is fetched back in the direction of the arrow 40 by a spring symbolized at 42, i.e. in a direction inverse to that of known types of dérailleurs,.

This base 30 is fixed in lateral translation. In this case, it comprises an intermediate plate with adjustment means having stoppers represented by screws in Figure 1.

On this base is also provided the stopper 44 of sheath 28.

A drive disk 46 mounted freely rotatable around an axis 48 parallel to the pivot axis 38 of the base, receives the cable 26 in its orifice so as to secure a good guidance.

A wing 50 having been manufactured with the base, extends essentially perpendicular to the plane of said base 30, and said wing supports the deformable guiding/dérailleur parallelogram 32.

This parallelogram 32 comprises two arms 52 and 54, a lower and an upper one, articulated, for one, relative to the wing 50 of the base around two axes 56 and 58 and, for another, relative to a guiding piece 60 around two axes 62 and 64. An anchoring means 66 allows the cable 26 to be fixed on the upper arm 54.

The guiding piece 60 hence is translationally movable along a straight line essentially parallel to the generating line of the virtual circular cone formed by the

set of pinions due to the deformable parallelogram, which is the case with known dérailleurs.

This guiding piece 60 comprises a guiding/dérailleur roller 68 mounted freely rotatable around an axis 71, which can only be seen in Figures 2 and 3.

A lateral flange 72 is associated with this guiding/dérailleur roller arranged on the same axis 71, so that the plane of the flange is parallel to the plane of the guiding/dérailleur roller.

The unit of the guiding/dérailleur roller 68 and of its flange 72 is translationally adjustable in the plane defined by the chain by means of the active pinion of the set of pinions and by means of the active disk of the set of disks, so that the unit can be disposed as close as possible to the pinions and in particular in the best position for allowing a good dérailleur action.

In the Figures 1 and 4, a further lateral pression dérailleur flange 73 is disposed essentially vis-à-vis of flange 72 of the guiding/dérailleur roller 68. This flange is position-variable along a line connecting the rotation axis 12 with the rotation axis 71 of the roller 68 so as to be as close as possible to the virtual cone constituted by the pinions.

The guiding piece 60 prolongs towards the front of the bicycle by a supporting arm 74.

The end 76 of this arm carries a bearing 78 in which an axis 80 fixedly connected to the plate 34 turns rotatably. A spring 82, represented by dashes, ensures the return in the direction of the arrow 84.

The movable tension plate 34 comprises a tension arm 86, which is the fixed member of the axis 80. The pivot point is essentially the centre of the arm of the embodiment illustrated in Figure 1. One recognizes that the movable arm 86 has a length reduced relative to the length of the different pieces such as the deformable parallelogram or the supporting arm.

At each of the two ends of this tension arm 86, a tension roller 88, 90, respectively a first and a second tension roller, is arranged mounted freely rotatable.

One recognizes the passage of the chain 24 over the first tension roller 88, under the second tension roller 90, over the guiding/dérailleur roller 68 before guiding flange 72, behind lateral pression flange 73 and under the corresponding pinion of the set 14 of pinions 16.

For the description of the function mode, the chain strands under tension and not under tension of the chain 24 have been marked with the reference numeral 24T, respectively 24M.

For the following description of the function mode of the dérailleur according to the invention, reference is to be made to all of the Figures 1, 2 and 3 at the same time.

Of course, only certain disk/pinion pairs are preferably susceptible to maintaining an optimum chain alignment, and that extreme combinations such as : small pinion g and small disk or large pinion a and large disk are preferably excluded for an application of the device according to the invention with the best performance.

In Figure 2, the chain 24 is on the small disk A of the three disks A, B and C of the set of disks 92 with its front dérailleur carrying the reference numeral 94, and on the fourth pinion d. This position corresponds essentially to the longest chain length to be recuperated, since the retained disk/pinion combination corresponds to the smallest peripheral length among the preferably susceptible combinations.

In this position, the chain strand 24M not under tension is guided by the roller 68, which is put onto the chain 24, since the base 30 is fetched back by the spring 42 in the direction of the arrow 40.

The guiding/dérailleur roller 68 is exactly in the plane of the corresponding pinion d.

The movable plate 34 ensures the tension and the taking up of the length of chain which is not used. For this purpose, the arm 86 has pivoted in the direction of the arrow 84 into its extreme position, the first roller 88 being up and the second roller 90 being down. The chain passage hence describes a kind of pronounced S, which corresponds to a long-distance path.

One states that there is a large ground clearance as compared to an arrangement according to prior art.

In Figure 3, due to the front dérailleur, the user has brought the chain onto the disk C having the largest diameter in combination with the same pinion d, which, for the depicted function mode and the retained combinations, corresponds to the shortest chain length to be taken up.

The tension arm 86, by a rotation inverse to that produced by the return spring 82, is then carried into a position, in which the S is scarcely pronounced and is lying, which leads to a *quasi* linear chain course.

One recognizes that the re-adjustment is calculated for the highest chain consumption and that, in this position, one could say that the dérailleur according to the invention does not produce any unnecessary chain consumption.

In this configuration, the ground clearance is even more improved as compared with the preceding position.

Moreover, the ground clearance is improved in all positions in a considerable manner, and the dérailleur is positioned in a space which essentially corresponds to the space required by the disks, whereby the ground clearance cannot be reduced.

According to the present invention, it is also possible to provide a variant with a simplification of the arrangement of the return springs.

A return spring is namely generally provided interposed between the two arms 52 and 54 of the deformable parallelogram so as to widen up the parallelogram and to guide the chain of the largest pinion a towards the smallest pinion g, said spring being then compressed by the force exercised by the user via the cable 26. It occurs rather often that the return force is insufficient for securing a free and efficient dérailleur action. Moreover, the force to be exercised on the cable is important, which fact can necessitate additional reductions.

In the case of the present invention, it is also possible to combine the two actions of the return springs of the parallelogram and the movable tension plate for diminishing the respective forces produced while maintaining the capacity of each of them to ensure efficient returns.

Thus, one has connected in Figure 5, which corresponds to the embodiment of Figure 1 with the same reference numerals for identical elements, a sector 102 of the roller fixed to the axis 80 supporting the tension arm 34 by means of a cable 100, with one 104 of the ends of the return spring 106 of the deformable parallelogram of the guiding/dérailleur means.

The sector 102 of the roller is so configured that the cable passes over it and ensures a rotation in the direction of the arrow 84 when a traction is exercised on cable 100.

The spring 106 is wound up so as to allow an interaction between the force resulting from the tension of the chain and the force which is necessary for the return of the parallelogram.

The action of the chain tension thus is obtained totally or partially by the reaction of the parallelogram return spring 106. It is namely possible to suppress the return spring 82 or to maintain it in certain cases, however, by modifying its force which has to be very limited.

In the case represented in Figure 6, the same is true for the winding-up direction near the return spring 106. For obtaining the desired action, one namely has to provide an inverse direction of winding up. This variant corresponds to the embodiment of Figure 4.

Mounting the base on a rotation axis with a return spring is essentially provided in the main embodiment so as to allow the disassembly of the rear wheel. However, it is also quite possible to provide it fixedly, in particular when the frame only comprises a single arm or means for a disassembly from behind.

It is also possible to configure the position of the rotation axis 80 of the tension plate variable, and in Figure 4 one recognizes that this axis can assume an extreme position in which said axis 80 coincides with the rotation axis of the second roller 90.

One can also replace the deformable parallelogram indicated in the main embodiment by any suitable means allowing for the replacement of the chain essentially parallel to a generating line of the virtual cone determined by the set of pinions.

The dérailleur according to the invention allows for arranging the entire dérailleur device comprising the two dérailleurs, front and rear, as well as the chain in a sealed case, which fact prevents the mechanism and the pinions from being affected, and leads to a reduced maintenance, to a higher reliability and to a better performance due to an appropriate and continuous lubrication.

This solution of encasing is quite suitable not only for off-road bicycles but also for city bikes and prevents the users from getting dirty.